10th Class 2016

Chemistry	Group-I	Paper-II
Time: 2.45 Hours	(Subjective Type)	Marks: 63

(Part-I)

2. Write short answers to any Five (5) questions: 10

(i) How can you know that a reaction has achieved an equilibrium state?

Ans When the rate of forward reaction takes place at the rate of reverse reaction, the composition of the reaction mixture remains constant, it is called a chemical equilibrium state.

(ii) What is relation between active mass and rate of reaction?

Ans The rate at which a substance reacts is directly proportional to its active mass and the rate of a reaction is directly proportional to the product of the active masses of the reacting substance.

(iii) Define pH. What is the pH of pure water?

Ans pH is the negative logarithm of molar concentration of the hydrogen ions, *i.e.*, $pH = -\log [H^+]$.

The pH value of pure water is 7.

(iv) Name two acids used in the manufacture of fertilizers.

Ans 1. HNO_3 2. H_2SO_4

(v) Why H^+ ion acts as a Lewis acid?

Ans H^+ ion acts as a Lewis acid because it has empty orbital that can accommodate a pair of electron.

(vi) How is coal formed?

Ans Coal was formed by the decomposition of dead plants buried under the Earth's crust millions of years ago. It is a Conversion of wood into coal is called carbonization.

very slow bio-chemical process. It takes place in the absence of air under high pressure and high temperature over a long period of time.

(vii) What is the importance of natural gas?

Ans Natural gas is so important that it is used as fuel in homes as well as in industries. It is used as fuel in automobiles as compressed natural gas (CNG). Natural gas is also used to make carbon black and fertilizer.

(viii) Write the classification of coal.

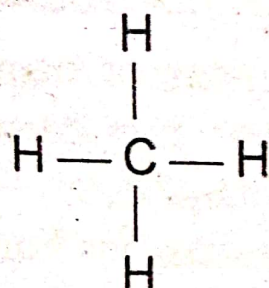
Ans

Types of coal	Carbon Contents	Uses
Peat	60%	It is inferior quality coal used in kiln.
Lignite	70%	It is soft coal used in thermal power stations.
Bituminous	80%	It is common variety of coal used as household coal.
Anthracite	90%	It is superior quality hard coal that is used in industry.

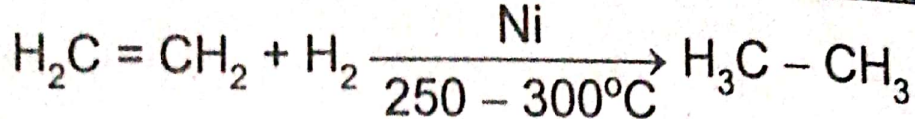
3. Write short answers to any Six (6) questions: 12

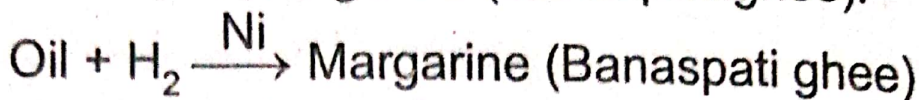
(i) What are saturated hydrocarbons? Give example.

Ans The hydrocarbons in which all the four valencies of carbon atoms are fully satisfied (saturated) by single bonds with other carbon atoms and hydrogen atoms are called saturated hydrocarbons. For example, methane, *i.e.,*

```
      H
      |
  H — C — H
      |
      H
```

(ii) Give process of hydrogenation of alkenes with chemical equation.

Ans Hydrogenation means addition of molecular hydrogen to an unsaturated hydrocarbon in the presence of a catalyst (Ni, Pt) to form saturated compound.

$$H_2C = CH_2 + H_2 \xrightarrow[250-300^\circ C]{Ni} H_3C - CH_3$$

On industrial scale, this reaction is used to convert vegetable oil into margarine (Banaspati ghee).

$$\text{Oil} + H_2 \xrightarrow{Ni} \text{Margarine (Banaspati ghee)}$$

(iii) Define carbohydrates. Write their general formula.

Ans Carbohydrates are the macromolecules defiend as polyhydroxy aldehydes or ketones. Their general formula is $C_n(H_2O)_n$.

(iv) What are polysaccharides? Give an example.

Ans The carbohydrates consisting hundreds to thousands of monosaccharides are called as polysachharides, *e.g.*, starch, cellulose, etc.

(v) Write the general formula of amino acid.

Ans The general formula for amino acids is:

(Side chain) R — CH — COOH (carboxylic group)
|
NH_2 (amino group)

(vi) Write the chemical formulas of palmitic acid and stearic acid.

Ans Palmitic acid = $C_{15}H_{31}COOH$

Stearic acid = $C_{17}H_{35}COOH$

(vii) What are the major constituents of troposphere?

Ans The major constituents of troposphere are *nitrogen* and oxygen gases. These two gases comprise *99%* by volume of the Earth's atmosphere.

(viii) How CO_2 is responsible for heating up atmosphere?

Ans As the concentration of CO_2 in air increases, less heat energy is lost from the surface of the Earth. Therefore, the average temperature of the surface gradually increases. This is called greenhouse effect. Due

to increased warming, this phenomenon is also called global warming.

(ix) How ozone layer forms in stratosphere?

Ans The mid-stratosphere has less UV light passing through it. Here O and O_2 recombine to form ozone which is an exothermic reaction. Ozone formation in this region results in formation of ozone layer. Thus, ozone layer exists in mid-stratosphere.

4. Write short answers to any Five (5) questions: 10

(i) How water rises in plants?

Ans Capillary action is the process by which water rises up from the roots of plants to leaves. This process is vital for the survival of the land plants.

(ii) What are the causes of hardness of water?

Ans The rainwater dissolves many salts of divalent cations like Mg^{2+}, Ca^{2+}, and anions like Cl^-, SO_4^{2-}, HCO_3^- and CO_3^{2-}, for example, gypsum ($CaSO_4.2H_2O$) and limestone ($CaCO_3$). These salts make the water hard.

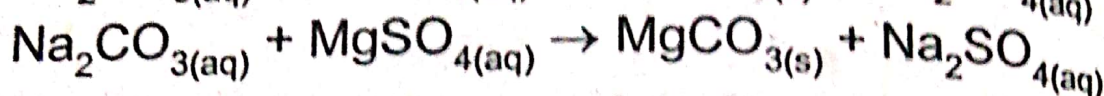
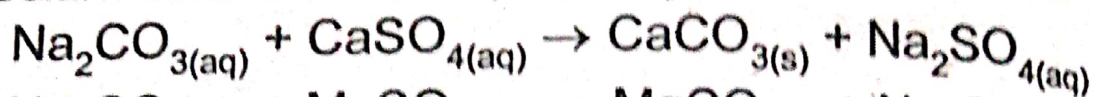
(iii) What are the reasons of water-borne diseases?

Ans Firstly, water pollution is the main cause of water-borne diseases. It may be due to toxins or microorganisms. Toxins are arsenic, mercury, lead and many organic chemicals. Microorganisms are viruses, bacteria, protozoa and worms. Secondly, lack of proper sanitation facilities is another major cause of rapidly spreading water-borne diseases.

(iv) **Give a method to remove permanent hardness of water.**

Ans The addition of washing soda removes the calcium and magnesium ions as the insoluble calcium and magnesium carbonates, respectively.

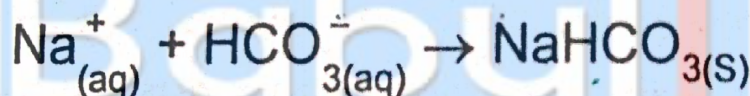
$$Na_2CO_{3(aq)} + CaSO_{4(aq)} \rightarrow CaCO_{3(s)} + Na_2SO_{4(aq)}$$

$$Na_2CO_{3(aq)} + MgSO_{4(aq)} \rightarrow MgCO_{3(s)} + Na_2SO_{4(aq)}$$

(v) **What is the difference between crude oil and residual oil?**

Ans The remains of dead plants and animals were converted into a dark brownish viscous crude oil. On the other hand, by the refining of crude oil, residual oil is obtained.

(vi) **What is the principle of Solvay's process?**

Ans Principle of Solvay's process lies in the low solubility of sodium bicarbonate at low temperature, *i.e.*, at 15°C. When CO_2 is passed through an ammoniacal solution of NaCl called ammoniacal brine, only $NaHCO_3$ precipitates.

$$Na^{+}_{(aq)} + HCO^{-}_{3(aq)} \rightarrow NaHCO_{3(S)}$$

(vii) **What is the role of pine oil in the froth flotation process?**

Ans Froth flotation process is based on the wetting characteristic of the ore and the gangue particles with oil and water, respectively.

The ore particles are preferentially wetted by oil and the gangue particles by water. The whole mixture is agitated with compressed air. Hence, oil coated ore particles being lighter come to the surface in the form of froth that can be skimmed.

(viii) Define petroleum.

Ans It is a complex mixture of several gaseous liquid and solid hydrocarbons having water, salts and earth particles with it.

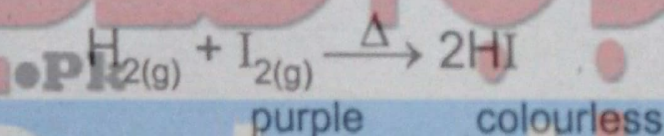
(Part-II)

NOTE: Attempt any Three (3) questions.

Q.5.(a) Differentiate between forward and reverse reaction. (4)

Ans Let us discuss a reaction between hydrogen and iodine. Because one of the reactant, iodine is purple, while the product hydrogen iodide is colourless, proceedings of the reactions are easily observable.

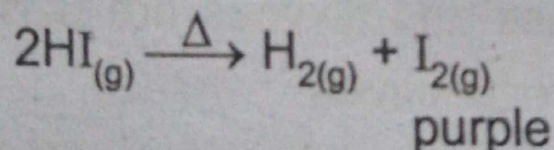
On heating hydrogen and iodine vapours in a closed flask, hydrogen iodine is formed. As a result, purple colour of iodine fades as it reacts to form colourless hydrogen iodide, as

$$H_{2(g)} + I_{2(g)} \xrightarrow{\Delta} 2HI$$

purple colourless

This reaction is called as forward reaction.

On the other hand, when only hydrogen iodide is heated in a closed flask, purple colour appears because of formation of iodide vapours. Such as

$$2HI_{(g)} \xrightarrow{\Delta} H_{2(g)} + I_{2(g)}$$

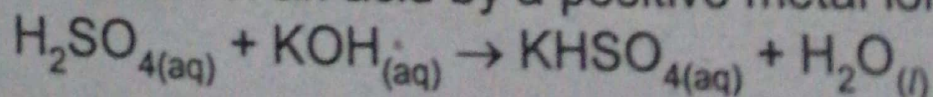
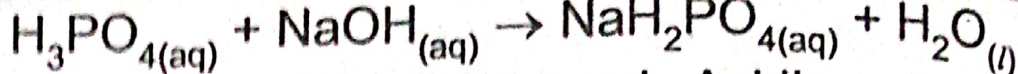
purple

In this case, hydrogen iodide acts as reactant and produces hydrogen and iodine vapours. This reaction is reverse of the above. Thus, it is called as reverse reaction.

(b) Differentiate between acidic and basic salts. (3)

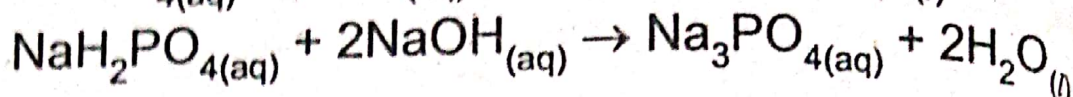
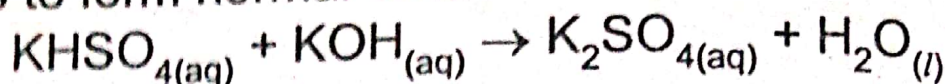
Ans **Acidic Salts:**

These salts are formed by partial replacement of a replaceable H^+ ions of an acid by a positive metal ion.

$$H_2SO_{4(aq)} + KOH_{(aq)} \rightarrow KHSO_{4(aq)} + H_2O_{(l)}$$

$$H_3PO_{4(aq)} + NaOH_{(aq)} \rightarrow NaH_2PO_{4(aq)} + H_2O_{(l)}$$

These salts turn blue litmus red. Acidic salts react with bases to form normal salts.

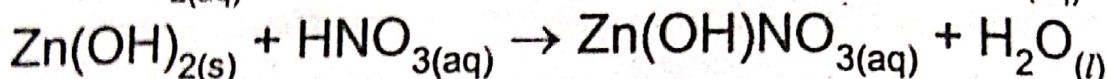
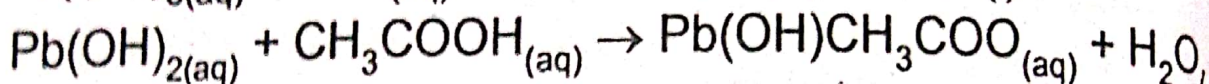
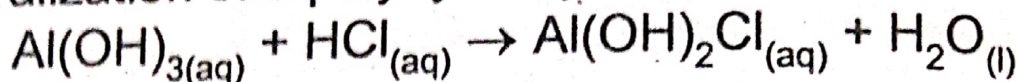
$$KHSO_{4(aq)} + KOH_{(aq)} \rightarrow K_2SO_{4(aq)} + H_2O_{(l)}$$

$$NaH_2PO_{4(aq)} + 2NaOH_{(aq)} \rightarrow Na_3PO_{4(aq)} + 2H_2O_{(l)}$$

Basic Salts:

Basic salts are formed by the incomplete neutralization of a polyhydroxy base by an acid.

$$Al(OH)_{3(aq)} + HCl_{(aq)} \rightarrow Al(OH)_2Cl_{(aq)} + H_2O_{(l)}$$

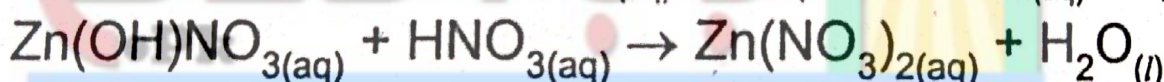
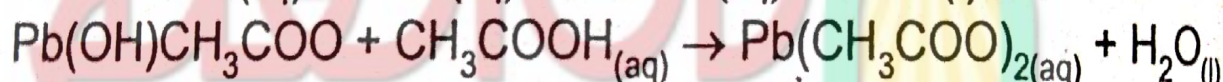
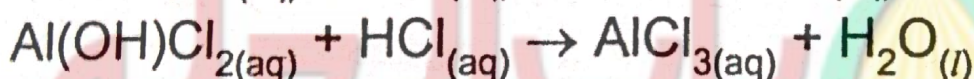
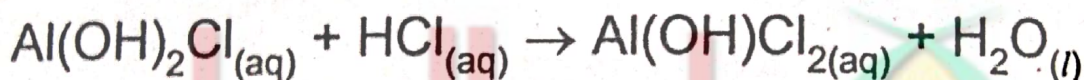
$$Pb(OH)_{2(aq)} + CH_3COOH_{(aq)} \rightarrow Pb(OH)CH_3COO_{(aq)} + H_2O_{(l)}$$

$$Zn(OH)_{2(s)} + HNO_{3(aq)} \rightarrow Zn(OH)NO_{3(aq)} + H_2O_{(l)}$$

These salts further react with acids to form normal salts.

$$Al(OH)_2Cl_{(aq)} + HCl_{(aq)} \rightarrow Al(OH)Cl_{2(aq)} + H_2O_{(l)}$$

$$Al(OH)Cl_{2(aq)} + HCl_{(aq)} \rightarrow AlCl_{3(aq)} + H_2O_{(l)}$$

$$Pb(OH)CH_3COO + CH_3COOH_{(aq)} \rightarrow Pb(CH_3COO)_{2(aq)} + H_2O_{(l)}$$

$$Zn(OH)NO_{3(aq)} + HNO_{3(aq)} \rightarrow Zn(NO_3)_{2(aq)} + H_2O_{(l)}$$

Q.6.(a) Give four properties of homologous series. (4)

Ans Following are four properties of homologous series:

1. All members of a series can be represented by a general formula. For example, general formula of alkanes, alkenes and alkynes are C_nH_{2n+2}, C_nH_{2n} and C_nH_{2n-2}, respectively.
2. Successive members of the series differ by one unit of $—CH_2—$ and 14 units in their relative molecular mass.
3. They have similar chemical properties.
4. They can be prepared by similar general methods.

(b) Write three sources of alkanes. **(3)**

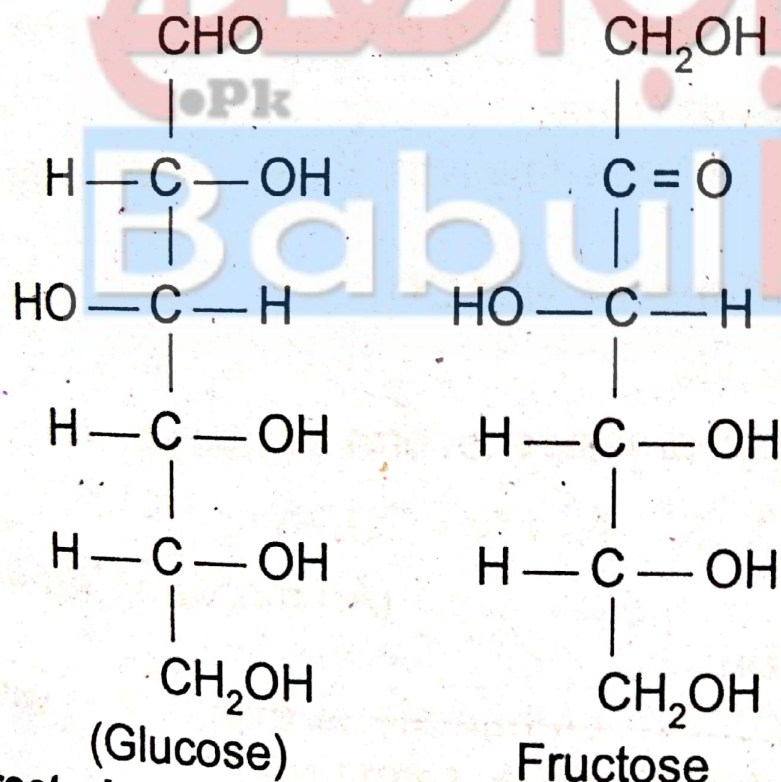
Ans Following are the three sources of alkanes:

1. The main sources of alkanes are petroleum and natural gas.
2. All the alkanes are obtained commercially by the fractional distillation.
3. Methane occurs in gobar gas, sewage gas and biogas which are formed by the decomposition of cattle dung, excreta and plant wastes.

Q.7.(a) How monosaccharides are prepared? Give their characteristics. (4)

Ans Monosaccharides:

Monosaccharides are the simplest sugars which cannot be hydrolyzed. They consist of 3 to 9 carbon atoms. Therefore, they are classified according to the number of carbon atoms in their molecules as trioses, tetroses, pentoses, hexoses, and so on. The preparation of important monosaccharides are given as follows. The structural formulas of them, are:

```
        CHO                      CH2OH
         |                         |
    H — C — OH                   C = O
         |                         |
   HO — C — H               HO — C — H
         |                         |
    H — C — OH                H — C — OH
         |                         |
    H — C — OH                H — C — OH
         |                         |
        CH2OH                    CH2OH
     (Glucose)                  Fructose
```

Characteristics:

Following are the characteristics of Monosaccharides:

1. Monosaccharides are white crystalline solids.
2. They are soluble in water and have sweet taste.

3. They cannot be hydrolyzed.
4. They are reducing in nature, therefore, these are called reducing sugars.

(b) Describe effects of acid rain. (3)

Ans For Answer see Paper 2015, (Group-II), Q.7.(b).

Q.8.(a) Write about cholera and cryptosporidium. (4)

Ans **Cholera:**

Cholera is an acute infection caused by the bacteria Vibrios cholera, which may be found in water contaminated by human faeces. Cholera causes severe diarrhea and can be fatal.

Cryptosporidium:

Water-borne microorganism that causes gastro-intestinal illness including diarrhea and vomiting. These tiny pathogens are found in surface water sources like reservoirs, lakes and rivers.

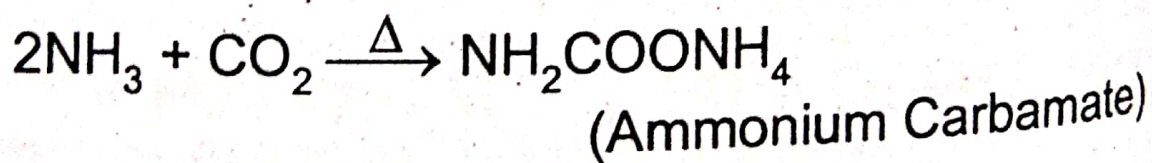
(b) Write about steps for the preparation of urea. (3)

Ans **Preparation of Urea:**

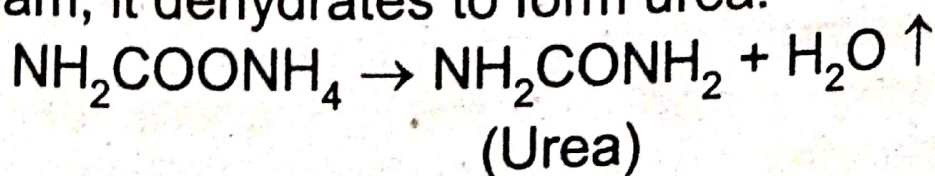
Preparation of urea involves three stages, given as under:

1. Reaction of Ammonia and CO_2:

Carbon dioxide (CO_2) is passed through liquid ammonia under high pressure to form ammonium carbamate

$$2NH_3 + CO_2 \xrightarrow{\Delta} \underset{\text{(Ammonium Carbamate)}}{NH_2COONH_4}$$

2. Urea Formation:

When ammonium carbamate is evaporated with the help of steam, it dehydrates to form urea.

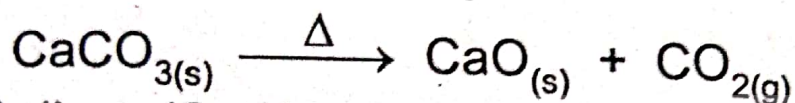
$$NH_2COONH_4 \rightarrow \underset{\text{(Urea)}}{NH_2CONH_2} + H_2O \uparrow$$

3. Granulation of Urea:

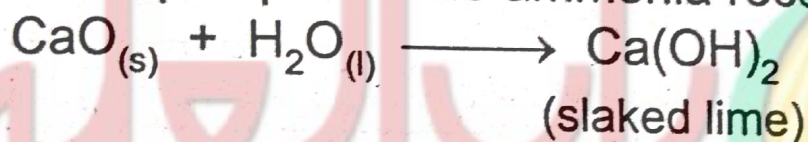
At this stage, liquid urea is evaporated to form granules. When liquid urea is sprayed from top of a tower under pressure and a hot current of air is introduced from the base, it evaporates to form granules. This is stored to be marketed.

Q.9.(a) Explain ammonia recovery process and preparation of carbon dioxide gas in Solvay's process. (4)

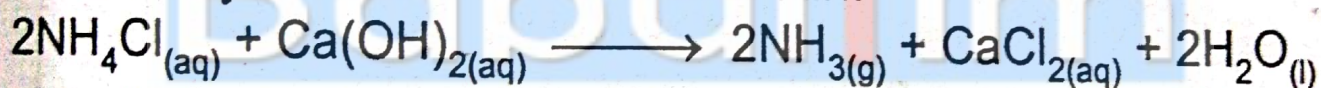
Ans (i) Preparation of carbon dioxide and slaked lime:

CO_2 is prepared by heating limestone in a lime kiln. Then it is carried to carbonating tower:

$$CaCO_{3(s)} \xrightarrow{\Delta} CaO_{(s)} + CO_{2(g)}$$

Quick lime (CaO) formed in lime kiln is slaked with water. Then, it is pumped to the ammonia recovery tower.

$$CaO_{(s)} + H_2O_{(l)} \longrightarrow \underset{\text{(slaked lime)}}{Ca(OH)_2}$$

(ii) Ammonia recovery tower:

Ammonia is recovered in this tower from ammonium chloride solution produced in the carbonated tower and calcium hydroxide formed in lime kiln.

$$2NH_4Cl_{(aq)} + Ca(OH)_{2(aq)} \longrightarrow 2NH_{3(g)} + CaCl_{2(aq)} + 2H_2O_{(l)}$$

In fact, all ammonia is recovered in this tower and is reused in the process. There are minor losses of ammonia in the process, which are compensated by using some fresh ammonia.

(b) What is greenhouse effect? Explain it. (3)

Ans Although CO_2 is not a poisonous gas, yet its increasing concentration due to burning of fossil fuels in different human activities is alarming. Because CO_2 in the atmosphere acts like a glass wall of a greenhouse. It allows UV radiations to pass through it but does not allow the IR radiation to pass through it. It traps some of the

infrared radiations emitted by the Earth. Hence, increased concentration of CO_2 layer absorbs the infrared radiations emitted by the Earth's surface that prevents heat energy escaping from the atmosphere. It helps to stop surface from cooling down during night. As the concentration of CO_2 in air increases, less heat energy is lost from the surface of the Earth. Therefore, the average temperature of the surface gradually increases. This is called greenhouse effect.

(Part-III)

(Practical Part)

Note: Attempt any TWO (2) questions.

A-(i) Write down the apparatus to determine the molarity of the given NaOH solution by volumetric analysis. (2)

Ans For Answer see Paper 2015, (Group-II), Q.A.(i)

(ii) Write down the procedure to identify metal ions by flame test. (3)

Ans For Answer see Paper 2015, (Group-II), Q.A.(ii)

B-(i) Write the required apparatus to identify ketone by using 2,4 dinitrophenyl hydrazine test. (2)

Ans For Answer see Paper 2015, (Group-I), Q.B.(ii)

(ii) Give procedure to identify ketone by using 2, 4 dinitrophenyl hydrazine test. (3)

Ans For the preparation of 2, 4-dinitrophenyl hydrazine (2, 4-DNPH), it is dissolved in alcohol and then added a small quantity of conc. H_2SO_4. Due to acid, the mixture becomes warm and the whole solid reagent is dissolved. In this way, 2, 4 DNPH is prepared.

C-(i) **Write the required apparatus to identify the saturated and unsaturated organic compounds by potassium permanganate test.** **(2)**

Ans For Answer see Paper 2015, (Group-I), Q.C.(i)

(ii) **Write down the procedure to identify phenol using ferric chloride test.** **(3)**

Ans **Material Required:**

Test tubes, test tube holder, test tube rack, dropper, safety goggles, phenol solution, freshly prepared ferric chloride solution and distilled water.

Procedure:

Take three test tubes, label them A, B, C and keep them in a test tube.

Take some phenol solution in test tube A, freshly prepared 1% ferric chloride solution in test tube B and distilled water in test tube C.

Dilute the phenol solution with distilled water and then add a few drops of freshly prepared ferric chloride solution in it. Note down the final observation.